

Claims

[c1] 1. A catheter generally flexible to conform to vascular areas of a body for use with a variable stiffness guidewire, comprising:
said catheter extending from a proximal end to a distal end;
said catheter having a lumen therein, the lumen sized to receive the guidewire therein;
said catheter having a pre-formed curved portion in its distal end (curved distal tip) of ninety degrees or greater;
the curved distal tip rotatable to different orientations by rotations of the proximal end of the catheter; and
the curved distal tip having
a flexibility to permit straightening of the curved distal tip by advancing the guidewire therethrough, and
shape retention memory to return to the original angle of curvature.

[c2] 2. The catheter of claim 1, wherein the proximal end to the distal end forms a first section, the pre-formed curved portion is less flexible than the first section.

[c3] 3. The catheter of claim 1, wherein the curved distal tip includes a first straight subsection, a pre-formed curved subsection, and a second straight subsection.

[c4] 4. The catheter of claim 1, wherein the curved distal tip includes a straight subsection and a pre-formed curved subsection.

[c5] 5. The catheter of claim 1, wherein the curved distal tip includes a pre-formed curved subsection and a straight subsection.

[c6] 6. The catheter of claim 3, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c7] 7. The catheter of claim 4, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c8] 8. The catheter of claim 5, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c9] 9.The catheter of claim 3, wherein the pre-formed curved subsection is disposed between the first straight subsection and the second straight subsection.

[c10] 10.The catheter of claim 1, wherein an amount of curvature of the curved distal tip can be controlled by a variable stiffness guidewire.

[c11] 11.The catheter of claim 1, wherein the pre-formed curved portion is formed of fused nylon.

[c12] 12.The catheter of claim 1, wherein the pre-formed curved portion is formed of plastic.

[c13] 13.The catheter of claim 1, wherein the pre-formed curved portion is formed of polyurethane.

[c14] 14.The catheter of claim 1, wherein the pre-formed curved portion includes a wire having shape memory characteristics.

[c15] 15.The catheter of claim 1, wherein the pre-formed curved portion includes a braided metal member.

[c16] 16.A catheter generally flexible to conform to vascular areas of a body, comprising:
said catheter extending from a proximal end to a distal end and having an intermediate section therebetween;
a variable stiffness guidewire slidably disposable within a lumen of the catheter, the guidewire having a guidewire proximal end and extending to a guidewire distal end;
the lumen sized to receive the guidewire therein;
the catheter having a pre-formed curved portion in its distal end (curved distal tip);
the curved distal tip rotatable to different orientations by rotations of the proximal end of the catheter; and
the curved distal tip having a flexibility to permit straightening of the curved distal tip by sliding the guidewire relative to the catheter.

[c17] 17.The catheter of claim 16, wherein the guidewire has a variable stiffness near the distal end with decreasing stiffness toward a distal tip of the guidewire.

[c18] 18.The catheter of claim 16, wherein the curved distal tip includes a first straight subsection, a pre-formed curved subsection, and a second straight subsection.

[c19] 19.The catheter of claim 16, wherein the curved distal tip includes a straight subsection and a pre-formed curved subsection.

[c20] 20.The catheter of claim 16, wherein the curved distal tip includes a pre-formed curved subsection and a pre-formed straight subsection.

[c21] 21.The catheter of claim 18, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c22] 22.The catheter of claim 19, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c23] 23.The catheter of claim 20, wherein a bending stiffness of the straight subsection is greater than a bending stiffness of the pre-formed curved subsection.

[c24] 24.The catheter of claim 18, wherein the pre-formed curved subsection is disposed between the first straight subsection and the second straight subsection.

[c25] 25.A method for catheterizing body passages, comprising the steps of:
introducing a variable stiffness guidewire into a body passage, the guidewire having a guidewire proximal end and a guidewire distal end;
disposing a lumen of a catheter over the variable stiffness guidewire, the catheter generally flexible to conform to vasculature of a body, the catheter extending from a proximal end to a distal end and having an intermediate portion therebetween, the catheter having a pre-formed curved portion in its distal end (curved distal tip), the curved portion

having a flexibility to permit straightening of the curved distal tip by sliding the guidewire relative to the catheter; slidably adjusting the variable stiffness guidewire relative to the catheter and straightening the pre-formed curved portion; introducing the guidewire and catheter into a body passage; advancing the catheter and guidewire through the body passage to an entrance of a first branched passageway; withdrawing the guidewire into the catheter allowing the catheter's curved distal tip to resume its pre-formed angle of curvature; advancing the guidewire and using the plurality of forces the desired angle of curvature of the curved distal tip of the catheter can be created, thereby allowing the guidewire to be advanced into the first branched passageway; and cannulating successively branched passageways by cooperatively manipulating and slidably adjusting the relative position of the guidewire and catheter from the exterior of the body until the desired body passageway is reached.

- [c26] 26.The method of claim 25, further comprising the steps of:
 - rotating the proximal end of the catheter to rotate the distal tip to different orientation, and
 - advancing further the guidewire and catheter.
- [c27] 27.The method of claim 25, further comprising the step of administering medication through the catheter.
- [c28] 28.The method of claim 25, further comprising the steps of removing the catheter and advancing an angioplasty balloon over the guidewire.
- [c29] 29.The method of claim 25, further comprising the steps of removing the catheter and advancing a stent over the guidewire.
- [c30] 30.The method of claim 25, further comprising removing the guidewire.
- [c31] 31.A catheter for use in combination with a variable stiffness guidewire, comprising:

a longitudinal axis, a proximal section and a distal section;
said distal section comprising a soft flexible pre-formed curved portion in
its distal end having a curvature of ninety degrees or greater and shape
retention properties;
said catheter having
an inner wall that defines a lumen that runs along said longitudinal axis
forming a single continuous tube, a reinforcement braid disposed over
said inner wall, and
an outside covering disposed over said reinforcement braid;
said catheter proximal end further comprising a spacer disposed between
said wall liner and said reinforcement braid; and
said reinforcement braid doubled over the proximately two-thirds of the
catheter.

[c32] 32. A catheter for use with a variable stiffness guidewire with a pre-formed
curved distal tip, comprising:

said catheter generally flexible to conform to vascular areas of a body,
said catheter extending from a proximal end to a distal end;
said catheter having a lumen therein, the lumen sized to receive a
guidewire therein;
the distal tip rotatable to different orientations by rotations of the
proximal end of the catheter; and
the distal tip having flexibility to permit bending of the distal tip by
advancing the variable stiffness guidewire therethrough.